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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/858,337

05/15/2001

William J. Schaff

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12/03/2003

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EXAMINER

DUONG, KHANH B

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/858,337

Applicant(s)

SCHAFF ET AL.

Examiner

Khanh Duong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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**DETAILED ACTION**

***Response to Amendment***

This Office Action is in response to the amendment, Paper No. 12, filed on September 8, 2003.

Accordingly, claims 1 and 5 were amended.

Currently, claims 1-19 are pending in the application.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Huang et al. (US 5,719,088).**

Huang et al. discloses a method of forming a channel heterojunction field effect transistor (see FIGs. 1-6 and accompanying text) comprising the steps of: forming a channel heterojunction field effect transistor having a top surface; and applying an AlN layer 25 to the top surface of the heterojunction field effect transistor 20. Huang et al. states at column 3, lines 55-59 that the AlN layer 25 is being employed as an etch stop layer to ensure that the etching process stops at the AlN layer 25 and reduces the possibility of incidental damage inherently to the layers below. Since the AlN etch stop layer 25 also functions as a protective layer for the layers below during the etching process as previously disclosed, it is appropriate to refer to such layer as a “passivation layer”.

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***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. in view of Yoshida (U.S. 6,281,099).**

Re claim 2, Huang et al. fails to show a thickness of the AlN layer being between approximately 500 and 2000 angstroms.

Yoshida, as previously cited in Paper No. 7, expressly teaches in Fig. 3 that the AlN layer 3 is formed using molecular beam epitaxy (MBE) wherein beams of Al and RF nitrogen are appeared to be applied simultaneously until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained (see col. 2, lines 45-48).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang et al. by selecting a thickness within the range as taught by Yoshida, since it has been held that where the general conditions of a claim are

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disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

**Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. in view of Kato et al. (U.S. 6,069,020).**

Re claims 3 and 4, Huang et al. fails to show Al and N being applied alternately until a desired thickness of AlN is obtained.

Kato et al. teaches using MBE processing with alternating beams or simultaneous beams to form a group II-VI compound semiconductor layer (see col. 5, lines 35-43). Since Kato et al. teaches the application of alternating beams in MBE processing, it should be inherent that such process comprises delaying a predetermined amount of time between each alternate application.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang et al. with the teaching of Kato et al. by forming an AlN layer using the MBE processing with alternating applications of Al and N, since such modification would provide an AlN layer having a low resistivity.

**Claims 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. in view of Yoshida (U.S. 6,281,099).**

Huang et al., as previously described, discloses a method of forming a channel heterojunction field effect transistor 20 having a passivation layer 25 of AlN formed on the top surface thereof (see FIGs. 1-6 and accompanying text).

Re claims 5 and 9, Huang et al. fails to show applying the AlN layer using molecular beam epitaxy (MBE) processing to a desired thickness of approximately 500 angstroms.

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Yoshida, as previously cited in Paper No. 7, teaches to apply an AlN layer 3 using MBE processing to a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) (see Fig.3; col. 2, lines 45-48).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang et al. with the teaching of Yoshida by forming an AlN layer using MBE processing, since Yoshida stated at column 1, lines 32-36, that such modification would provide an AlN layer having low resistivity and excellent in electrical conductivity and thermal conductivity.

**Claims 6-8 and 10-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. in view of Yoshida as applied to claim 5 above, and further in view of Kato et al. (U.S. 6,069,020).**

Re claims 6-8 and 10-19, the combined teaching of Huang et al. and Yoshida discloses employing simultaneous, instead of alternating, applications of Al and RF nitrogen beams at a predetermined amount of time between the alternating beams and at a certain temperature until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained (see Yoshida, col. 2, lines 45-48).

Kato et al. shows that application of alternating and simultaneous beams are equivalent techniques known in the art of MBE processing (see col. 5, lines 35-43). Therefore, because these two techniques were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute one technique for the other. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang et al. by selecting a thickness for the AlN

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layer, a delay time between alternating beams and a temperature as combinatively taught by Yoshida and Kato et al., since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

### ***Response to Arguments***

Applicant's arguments filed September 8, 2003 have been fully considered but they are not persuasive.

Applicant argues that AlN layer 25 of the Huang et al. reference is an etch stop layer and not a passivation layer. The Examiner respectfully disagrees because, as previously discussed above, such AlN layer not only functions as an etch stop layer, but also as an intermediate protective or passivation layer for the layers below during an etching process (see col. 3, lines 55-59). Applicant is directed to such similarity in the instant application, specifically in FIG. 7, where passivation layer 32 expressly functions as an etch stop during the etching or patterning process of resist layer 64.

Applicant argues that "the passivation layer is formed on the top surface of the heterojunction channel field effect transistor, not on top of other layers as shown in Huang et al.". The examiner respectfully disagrees because Huang et al. clearly shows in FIG. 2 the AlN intermediate passivation layer 25 as being formed on a top surface of the HFET which comprises of a source 16, a drain 17 and a gate area 18. Applicant is once again directed to such similarity in the instant application, specifically in FIG. 9, where passivation layer 32 is expressly shown as an intermediate passivation layer of HFET 10.

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Applicant argues that the “Office Action contains no assertion that delaying a predetermined amount of time necessarily flows from the description of Kato et al” and that “there is no requirement that there be a time period between alternate applications of the beams, since Kato et al. is capable of operating them at the same time”. The Examiner respectfully disagrees because Kato et al. clearly suggests two completely different modes of MBE processing comprising alternating beams and simultaneous beams. In order for the beams to behave in an alternating manner, a predetermined amount of time, assuming a value greater than zero, must exist between each application. Otherwise, the beams would have behaved in a simultaneous manner.

Applicant further argues the Kato et al. reference may not be enabling because FIG. 2 of the reference should be a structural diagram of an MBE apparatus, instead of a circuit diagram as shown. While the Examiner agrees with Applicant regarding the incorrect figure, Applicant is advised that such figure was not relied on by the Examiner in the previous Office Action. Despite the incorrect figure, one of ordinary skill in the art would have found it obvious to visualize the MBE apparatus from reading the supporting text at column 5, lines 35-43.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).



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In this case, the combined teachings of Huang et al., Yoshida and Kato et al. clearly suggest the claimed invention as described above.

*Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

See Notice of References Cited for relevant teachings related to the instant invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Duong whose telephone number is (703) 305-1784. The examiner can normally be reached on Monday - Friday (9:00 AM - 6:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian, can be reached on (703) 308-4905. The fax phone numbers for the

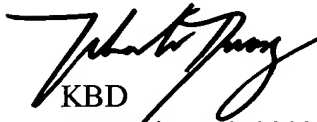
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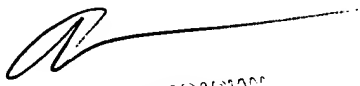
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organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

  
KBD  
November 26, 2003

  
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